

Lesson 1

The structure of the atom

What is an atom and how big is an atom?

If you were to cut a piece of iron into smaller and smaller pieces you will eventually finish up with the smallest piece of iron that can exist – called an **atom**. You can do this with any of the elements in the **Periodic Table**. Each time you will end up with an atom.

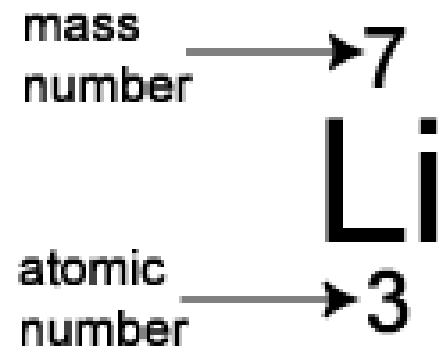
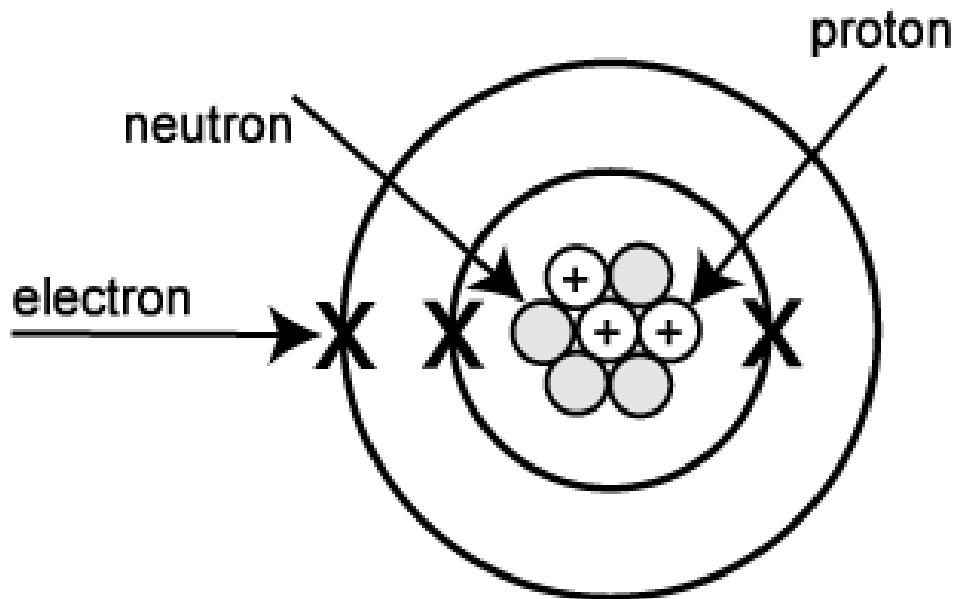
An atom of one element is different to the atoms of all the other elements in size and mass. Atoms are small: a cube of iron with side 1 cm contains about

100 000 000 000 000 000 000 000 atoms (or 10^{23} atoms).

The smallest atom is that of Hydrogen.

What is an atom made of?

An atom is made up of three subatomic particles.



Subatomic particle	Mass	Charge	Position in atom
Proton	1	+1	Nucleus
Neutron	1	0	Nucleus
Electron	0 (1/1800)	-1	Shells or orbits

Fact:

An atom has no (zero) overall charge.

Rules:

- The **atomic number** tells you how many **protons** there are in one atom of an element.
- The number of **electrons** is **equal** to the number of **protons**, which is why the atom has no overall charge.
- Since the mass of the atom is made up of the neutrons and protons, the number of neutrons in an atom is calculated by:
Atomic mass – atomic number = number of neutrons.

	Protons	Electrons	Neutrons
${}^7_3\text{Li}$			
${}^{23}_{11}\text{Na}$			
${}^{24}_{12}\text{Mg}$			
${}^{103}_{45}\text{Rh}$			

Atom	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons
${}_{6}^{12}\text{C}$	6	12	6	6	6
${}_{11}^{23}\text{Na}$	11	23	11	12	11
${}_{9}^{19}\text{F}$	9	19	9	10	9
${}_{20}^{40}\text{Ca}$	20	40	18	22	20
${}_{19}^{39}\text{K}$	19	39	19	20	19
${}_{13}^{27}\text{Al}$	13	27	13	14	13
${}_{79}^{197}\text{Au}$	79	197	79	118	79
${}_{35}^{79}\text{Br}$	35	79	35	44	35
${}_{92}^{238}\text{U}$	92	238	92	146	92

Lesson 2 – How are electrons arranged in shells around the nucleus